The impact of layer height on a 3D Print

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Learn about the importance of layer height and how it affects the quality, appearance and printability of 3D printed parts

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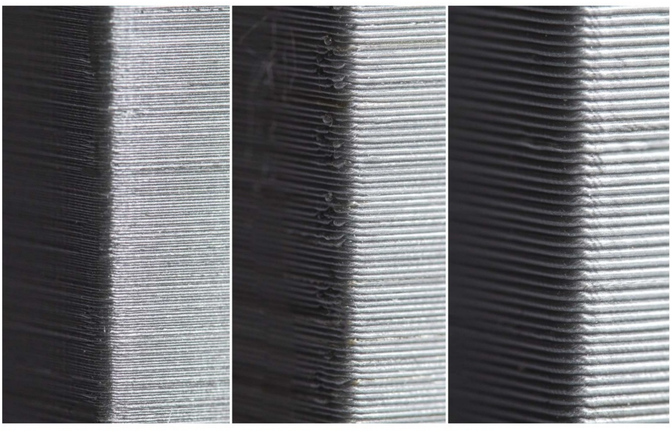
Introduction

All additive manufacturing methods are based around a part being built layer by layer. Because of this, layer height determines the resolution or quality of a print similar to the resolution on a television or computer monitor but in 3D. Lower layer height (higher resolution) typically results in a part being printed with smoother surfaces. The downside to this is an increase in the time to complete a print.

It is important that a designer understands whether aesthetics are critical (a lower layer height) to a design or whether an affordable quick print (higher layer height) will be adequate.

3 FDM parts printed at 50, 200 and 300 microns (left to right).



A macro view of the FDM prints (50, 200 and 300 microns from left to right) shown at the same scale for comparison.

Why is layer height important?

For some printing methods (particularly SLS and Polyjet) selection of layer height is not critical as the default resolution these technologies print at is already adequate for most applications. For other methods (FDM and SLA) layer height is an important design parameter that impacts the printing process (time & cost) and the visual and physical properties of a printed part.

Often the difference between an identical part printed at 100 microns and 200 microns is very hard to distinguish however the 100 micron part will take twice as long to print and cost more.

Understanding the final application of a part is always important when selecting the layer height. If a part has sharp edges that are required for the functionality of the part or if a part fits into another part then a smaller layer height is ideal.

Curves and angles

Layer height is more discernible on curves and angles and is less discernible on straight vertical walls and cubes. If a design includes a significant number of curves or angles using a lower layer height will reduce the visual impact of the layer effect.

Vertical resolution

Layer height will have an impact on vertical resolution affecting how smooth the sides of a print are. Examining the side of a 100 micron print will show some texture with this effect being further exaggerated with a 200 micron print. This is particularly important if a print has interlocking or connecting parts where surface area and finish govern the robustness of the connection.

Likelihood of print failure

For some 3D printing technologies selecting a lower layer height can be detrimental to the printing process. For SLA a 100 micron print is 3 times less likely to fail when compared to a 25 micron print. This is due to the "peeling" stage of the SLA process where the model is separated from the resin tank after each layer is cured with the laser. The visual difference between a 100 micron and 25 micron SLA print for geometrically basic models is difficult to distinguish.

Post processing

When deciding on layer height it is also important to consider post-processing. A larger layer height may be adequate if the part is going to be sanded, acetone cleaned or painted.

Common layer heights

The table below highlights some of the typical layer heights offered by a range of 3D printing technologies.

Technology	Common layer thickness (microns)
FDM	100 - 300
SLA	25 - 100
SLS	50 - 100
Polyjet	16 - 30
Binderjet	100 - 300
Metal printing (SLM or DLSM)	25 - 100

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